

Central Valley Regional Water Quality Control Board

TO: Susan Fregien
Senior Environmental Scientist
IRRIGATED LANDS REGULATORY PROGRAM

FROM: Ashley Peters
Water Resource Control Engineer
IRRIGATED LANDS REGULATORY PROGRAM

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SUBJECT: REVIEW OF THE GROUNDWATER TREND MONITORING WORKPLAN AND
DATA GAP ASSESSMENT PLAN FOR THE CALIFORNIA RICE COMMISSION

On 1 October 2015, the California Rice Commission (CRC) submitted the *Groundwater Trend Monitoring Workplan and Data Gap Assessment Plan* (Workplan) as required by the Monitoring and Reporting Program (MRP) for General Order R5-2014-0032. A revised draft of the Workplan was submitted on 30 March 2016.

As stated in the MRP, the objectives of Groundwater Quality Trend Monitoring are (1) to determine current water quality conditions of groundwater relevant to rice operations, and (2) to develop long-term groundwater quality information that can be used to evaluate the regional effects (i.e., not site-specific effects) of rice operations and its practices. The MRP identified twenty groundwater wells comprising a groundwater monitoring network that will be monitored for rice lands in the Sacramento Valley to reach the objectives. The existing shallow wells are specifically designed to yield data which can be compared with historical and future data to evaluate long-term groundwater trends.

In addition to describing the methods that will be utilized to achieve the trend monitoring requirements, the Workplan was required to address the Yuba County and fringe data gaps areas (see Figure 1) and include the proposed elements to resolve the data gaps, as identified in the Groundwater Quality Assessment Report (GAR).

REVIEW OF THE TREND MONITORING PLAN

The CRC identified twenty wells (see Table 1) for monitoring in their Workplan. Of these twenty wells, eighteen of them are wells identified by the MRP for monitoring and two are replacement wells. Well 20 was abandoned by the United States Geological Survey (USGS) and formerly abandoned Well 23, located 100 feet south of Well 20, was re-drilled as a replacement. Well 24 was re-drilled by USGS approximately 50 feet east of its original location. The depths of both replacement wells reach to within 5 feet below ground surface (bgs) of the wells that they replaced. All of the other monitoring locations included in the Workplan remain consistent with those identified in the MRP.

Groundwater trend monitoring will be conducted on a rotating schedule, as described in the MRP, with all twenty wells sampled every 5 years and half of the wells sampled in all other years on an alternating basis (see Table 1). The wells will be sampled in alternate years based

on their location in either the eastern or western half of the monitoring well network. Staff requested the east-west division over the previously proposed north-south division to provide greater geographic coverage of the groundwater basins in alternate years due to the density of wells in the northern half of the monitoring area (see Figure 1). The constituents that will be analyzed during each sampling event are identified in Table 1 and are consistent with the requirements of the MRP.

Groundwater trend monitoring of rice lands is scheduled to commence in the summer of 2017. This will allow for coordination with USGS (the owner of the wells to be monitored), which is scheduled to sample all of the wells in 2017. Subsequent years of sampling will be conducted in August.

Groundwater trend monitoring results will be provided in annual monitoring reports and will include a map of the sampled wells, analytical data, and time concentration charts. Data from each well, including any applicable historical data, will also be compiled into an electronic database and analyzed for statistically significant trends using a method such as Mann-Kendall trend analysis, beginning after the first 3 years of sampling have been completed. After the third year of monitoring, the CRC may request a reduction in groundwater monitoring for approval by the Executive Officer.

REVIEW OF THE DATA GAP ASSESSMENT

The CRC identified three data gaps areas in the GAR where limited or no groundwater data was available to make final conclusions regarding groundwater vulnerability. They are the northern Glenn County, Yuba County, and Eastern Sutter and Placer Counties data gaps areas (see Figure 1). The objectives of the data gap assessment were outlined in the GAR and are summarized as (1) perform additional data collection and analysis, (2) determine whether any impacted groundwater areas are attributed to rice, and (3) determine if additional studies are needed to characterize the data gaps areas.

Yuba County Data Gaps Area

The CRC followed the approach proposed in the GAR to meet the objectives of the data gap assessment. In the Yuba County data gap area, additional wells were identified for data collection and analysis. These wells included nineteen Yuba County Water Agency (YCWA) PMW Series wells, ten Department of Water Resources (DWR) wells, and four other YCWA wells monitored for California Statewide Groundwater Elevation Monitoring where groundwater quality sampling has been performed. Figures provided in Appendix C of the Workplan show the locations of each well. Nitrate, total dissolved solids (TDS), and electrical conductivity (EC) data from these wells was reviewed to assess the groundwater quality. Sample results for each well are summarized in Table 2.

Historical exceedances of the maximum contaminant level (MCL) for nitrate (as NO_3) of 45 milligrams per liter (mg/L) have been observed in two DWR wells (13N04E12H004M and 16N03E36E002M). The average nitrate concentrations for these wells, 31.5 and 34.2 mg/L from ten and nine sample events, respectively, covering a period of 34 years, are below the MCL, but greater than half of the MCL. The most recent nitrate results for these wells were also below the MCL. None of the other wells have exceeded the MCL for nitrate. Exceedances for salinity, indicated by the MCLs for TDS (500 mg/L) or EC (900 microSiemens per centimeter [$\mu\text{S}/\text{cm}$]), have occurred in one YCWA monitoring well (PMW-29) and three DWR wells (14N05E16Q001M, 13N04E12H004M, and 16N03E36E002M). Only one DWR well (14N05E16Q001M) has exceeded the upper limits for TDS (1,000 mg/L) and EC (1,600 $\mu\text{S}/\text{cm}$).

The four wells where exceedances have occurred are geographically distributed in such a way (greater than 1 mile between any two wells) that they do not represent a potential issue in a

localized area. The well locations are described in Table 2. Results from the twenty-nine other wells had no exceedances of the MCLs for nitrate, TDS, or EC. Accumulated groundwater quality data generally showed low levels of nitrate and salinity, so the Yuba County data gap area can be considered low vulnerability.

Six of the DWR wells (see Table 3) were selected by the CRC for inclusion in the rice groundwater quality monitoring well network for ongoing data review purposes. DWR monitors these wells every other year and the monitoring results will be utilized by the CRC for their groundwater trend analysis.

Fringe Data Gaps Areas

Limited or no groundwater monitoring wells were identified in the Glenn County and Eastern Sutter and Placer Counties (fringe) data gaps areas. In the fringe data gaps area, since groundwater quality data was limited, CRC conducted a soil data analysis to evaluate the depth to duripan, other restrictive layers, and soil characteristics that affect the potential impacts of rice to groundwater.

In the fringe data gaps areas, soil analysis identified well drained surficial soils with water-restricting features in the subsoil similar to the soil in the Yuba County area. The CRC took a correlative approach in the assessment of the fringe data gaps areas based on the fact that the “generally large, contiguous rice acreages in the Sacramento Valley are farmed continuously in rice with similar and consistent rice-farming practices”. Based on this correlation the CRC concluded that the fringe data gaps areas are also low vulnerability. Staff agrees with this correlative approach, which is consistent with the approach taken in the GAR.

SUMMARY

The Workplan contained the necessary components and supporting information needed to determine whether the plan for groundwater trend monitoring will meet the goals outlined in the MRP. The CRC plans to monitor all of the wells identified for groundwater trend monitoring by the MRP for the constituents and on the schedule that the MRP specified except for two wells, which were replaced by DWR. The replacement wells will be sampled in lieu of the wells that were replaced.

In addition, the CRC will include six additional DWR wells identified in Table 3 (shown on Figure 2) in its trend analysis. CRC will not monitor the DWR wells, but will use the data from DWR in its analysis. No additional data from the fringe data gaps areas will be used for trend monitoring because it is limited, where available, and the areas exhibit similar soils and practices to other monitored areas that the groundwater quality can be correlated to when assessing rice impacts to groundwater.

Staff finds the Workplan to be consistent with the requirements outlined in the MRP and recommends the Workplan for Executive Officer approval. Staff also recommends that Appendix B of the Workplan, which is the groundwater Quality Assurance Project Plan (QAPP), be addressed separately from the Workplan with the surface water QAPP, which has been revised by the CRC and is currently under staff review.

Table 1. Trend Monitoring Plan

USGS Report Well ID	Mapping ID	Well Depth (feet bgs)	Years Monitored ^a	Annual Parameters	5-Year Parameters (2017, 2022, on)
2	18H1M	50	EVEN	- Conductivity - pH - Dissolved Oxygen - Temperature - Total dissolved solids - Nitrate + nitrite as nitrogen - Total ammonia as nitrogen	Anions: - Carbonate - Bicarbonate - Chloride - sulfate Cations: - boron - calcium - sodium - magnesium - potassium
3	09B2M	29	EVEN		
6	10R1M	44	EVEN		
8	16R1M	35	ODD		
9	03E1M	35	ODD		
10	35M1M	35	ODD		
11	14G1M	35	ODD		
12	27B1M	33.5	EVEN		
15	09L1M	35	EVEN		
16	12G2M	35	ODD		
17	08D1M	38.5	EVEN		
18	25R1M	38.5	ODD		
19	25E1M	35	ODD		
21	22B1M	35	EVEN		
22	23E1M	35.5	ODD		
23 ^b	09C2M	45 (48.6)	EVEN		
24 ^c	35J2M	35 (35.1)	EVEN		
25	32J1M	35	ODD		
26	25A1M	35	ODD		
28	08A1M	35	EVEN		

Notes:

^a All wells will be monitored in 2017.^b Replaces Well 20. Depth of Well 20 listed in parentheses.^c Replaces original Well 24. Depth of original Well 24 listed in parentheses.

Table 2. Historical Data Summary

Well ID	Screened Interval (ft bgs)	Nitrate (mg/L) ^a	TDS (mg/L) ^a	EC (µg/L) ^a	Location Description ^b
PMW-01A	120-130	2.7	322	521	
PMW-01B	216-226	0.9	220	261	
PMW-02A	92-122	3.9	--	406	
PMW-02B	150-180	ND	--	353	
PMW-02C	210-240	ND	--	442	
PMW-05	80-100	4.9	369	587	
PMW-06	224-244	ND	233	360	
PMW-07A	56-66	25.5	276	410	
PMW-07B	142-202	28.6	266	403	
PMW-07C	425-445	0.7	340	537	
PMW-10	308-318	1.4	160	293	
PMW-13	206-216	ND	134	321	
PMW-16	176-196	4.4	--	190	
PMW-21	80-100	8	--	312	
PMW-22	228-238	ND	163	236	
PMW-23	110-130	16.4	204	260	
PMW-25	260-280	3.1	225	310	
PMW-27	150-170	5.6	306	306	
PMW-29	145-155	ND	548	831	In northern Yuba County near the upstream boundary of the Yuba groundwater basin.
13N04E02A002M	--	2.7 - 28.3	204 – 455	260 – 723	
13N04E12H004M	--	5.3 - 77.6	373 – 898	432 – 1288	In the South Yuba subbasin outside of the rice fields, in an area that grows different crops.
14N04E14J002M	--	4.8 - 29.6	163 – 382	190 – 648	
14N05E16Q001M	--	2.7 - 4.9	597 – 1654	720 – 2456	Downgradient of rice fields, but within other land use types.
15N04E23Q001M	--	ND - 12.5	97 – 233	170 – 401	
16N03E36E002M	--	14 - 56.3	310 – 551	510 – 785	In the North Yuba subbasin in a rice field, but close to other land use types.
16N04E34E001M	--	3 - 5.5	125 – 197	171 – 331	
16N04E27F002M	--	1 - 4.9	90 – 154	140 – 220	
16N03E24M002M	--	17 - 42.6	286 - 442	460 - 772	
14N04E20D002M	--	ND - 0.2	--	--	
YCWA-10	180-200	ND	164	262	
YCWA-12	155-175	ND	251	417	
YCWA-13	180-200	2.9	227	338	
YCWA-15	175-195	6.9	285	415	

Notes:

^a Data range provides minimum – maximum concentrations where multiple sample events have occurred.^b Location descriptions only provided for wells with historical exceedances.

-- = results/information not provided by the CRC

Bold = indicates exceedance of the MCL. Nitrate (45 mg/L), TDS (500 mg/L), and EC (900 µS/cm)

ND = non-detect, result <0.1

Table 3. Data Gaps Assessment Plan

DWR Well ID	Well Type	Well Depth (feet bgs)	Next Year Monitored ^a	Parameters	
13N04E02A002	Irrigation	185	2016	- Conductance (EC)	- Chloride
14N04E14J002M	Domestic	162	2017	- pH	- sulfate
15N04E23Q001M	Domestic/ Irrigation	120	2017	- Dissolved Oxygen	- boron
16N03E24M002M	Domestic	105	2017	- Temperature	- calcium
16N03E36E002M	Domestic	86	2017	- Total dissolved solids	- sodium
16N04E27F002M	Domestic	105	2016	- Nitrate	- magnesium
				- Carbonate	- potassium
				- Bicarbonate	

Notes:

bgs = below ground surface

^a Wells monitored every other year.

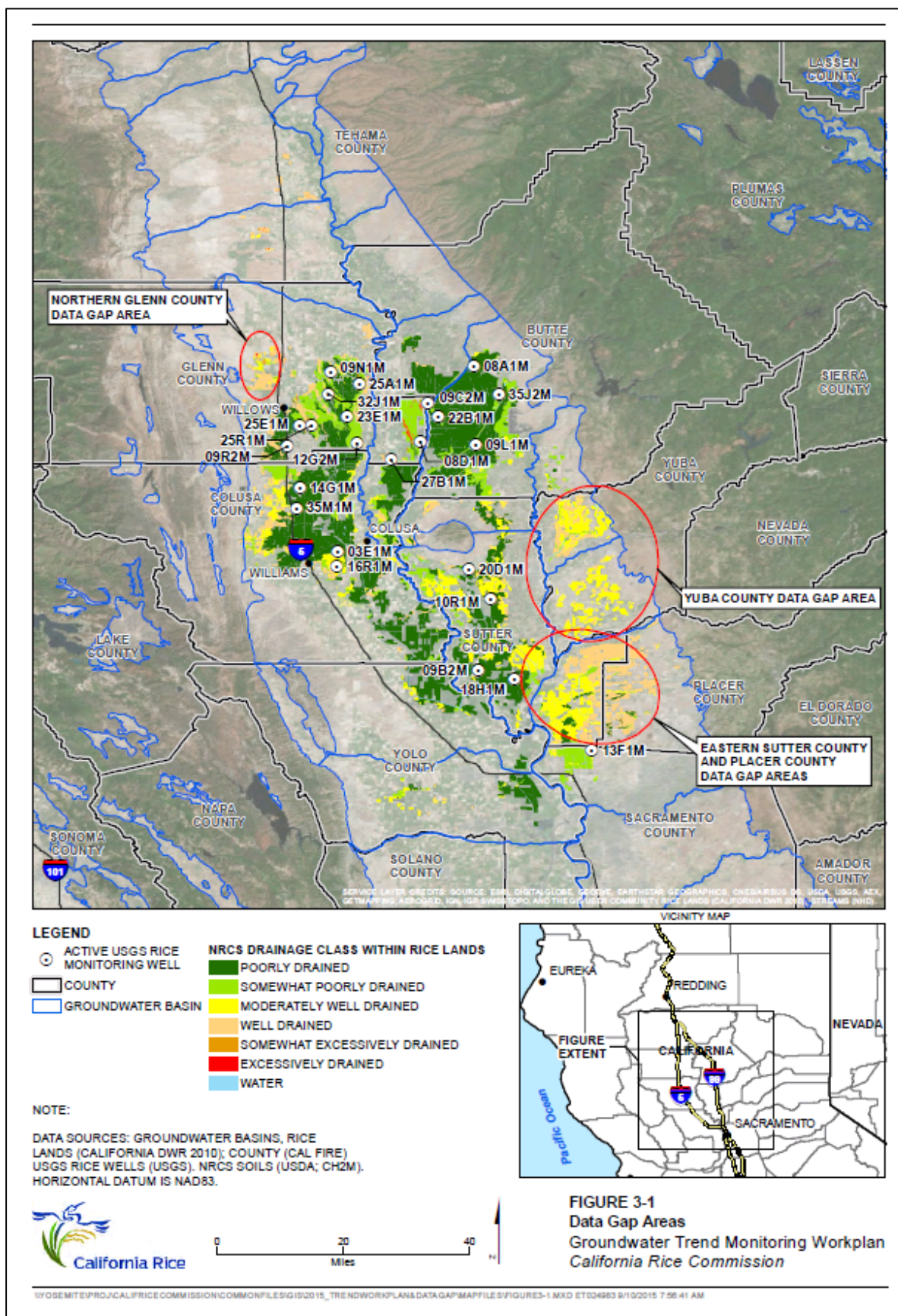


Figure 1. Groundwater trend monitoring well network and data gaps areas, taken from the CRC Workplan.

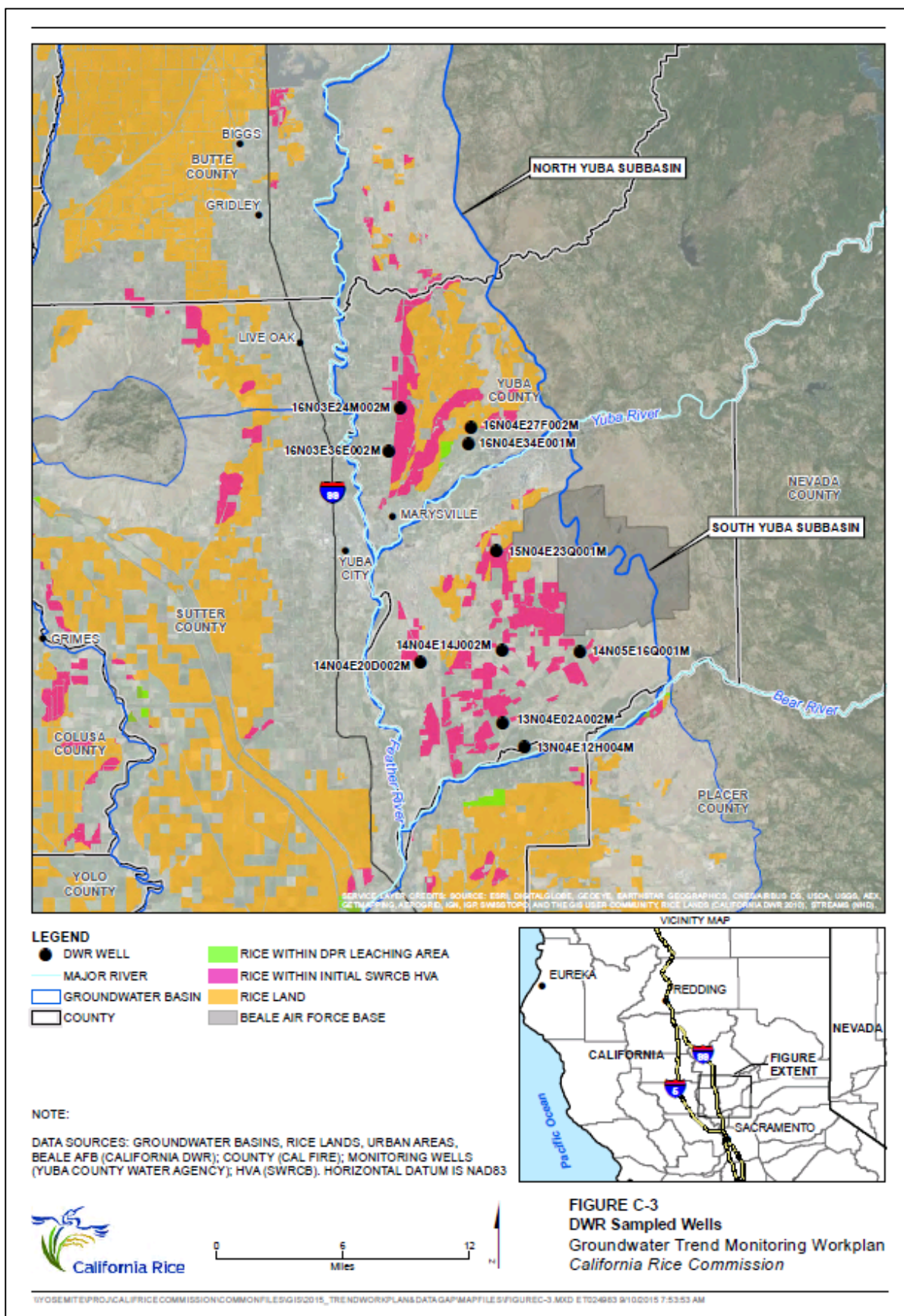


Figure 2. Groundwater trend monitoring well network: data gaps areas, taken from the CRC Workplan.